DATA SHEET

TDA1510AQ
24 W BTL or 2 x 12 W stereo car radio power amplifier

Product specification
File under Integrated Circuits, IC01

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Philips Semiconductors

PHILIPS

24 W BTL or 2 x 12 W stereo car radio power amplifier

TDA1510AQ

GENERAL DESCRIPTION

The TDA1510AQ is a class-B integrated output amplifier encapsulated in a 13-lead single in-line (SIL) plastic power package. Developed primarily for car radio application, the device can also be used to drive low impedance loads (down to 1,6 Ω). With a supply voltage (V_P) of 14,4 V, an output power of 24 W can be delivered into a 4 Ω Bridge Tied Load (BTL), or when used as a stereo amplifier, 2 × 12 W into 2 Ω or 2 × 7 W into 4 Ω.

Features

- Flexibility – stereo as well as mono BTL
- Low offset voltage at the output (important for BTL)
- Load dump protection
- A.C. short-circuit-safe to ground
- Low number, small sized external components
- Internal limiting of bandwidth for high frequencies
- High output power
- Large useable gain variation
- Good ripple rejection
- Thermal protection
- Low stand-by current possibility
- High reliability.

QUICK REFERENCE DATA

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage range:						
operating		V_P	6,0	14,4	18,0	V
non-operating		V_P	–	–	28,0	V
non-operating, load dump protection		V_P	–	–	45,0	V
Repetitive peak output current		I_{ORM}	–	–	4,0	A
Total quiescent current		I_{tot}	–	75	120	mA
Stand-by current		I_{sb}	–	–	2	mA
Switch-on current		I_{so}	0,15	0,35	0,80	mA
Input impedance	pins 1, 2, 12 and 13	$\|Z_I\|$	1	–	–	MΩ
Storage temperature range		T_{stg}	–65	–	+ 150	°C
Crystal temperature		T_c	–	–	150	°C

PACKAGE OUTLINE

TDA1510AQ: 13-lead SIL-bent-to-DIL; plastic power (SOT 141C); SOT141-6; 1996 Aug 01.

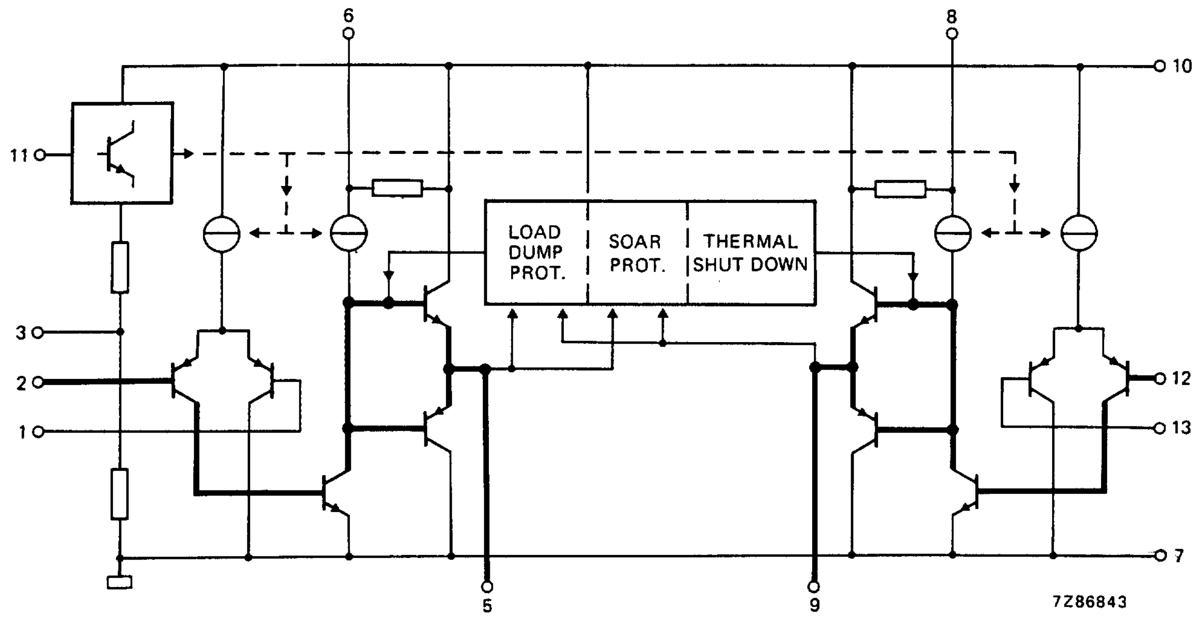


Fig.1 Functional diagram; heavy lines indicate signal paths.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

PARAMETER	CONDITIONS	SYMBOL	MIN.	MAX.	UNIT
Supply voltage:					
operating	pin 10	V_P	–	18	V
non-operating		V_P	–	28	V
non-operating,					
load dump protection	during 50 ms	V_P	–	45	V
Peak output current		I_{OM}	–	6	A
Total power dissipation	see Fig.2	P_{tot}			
Storage temperature range		T_{stg}	–65	+ 150	°C
Crystal temperature		T_c	–	+ 150	°C

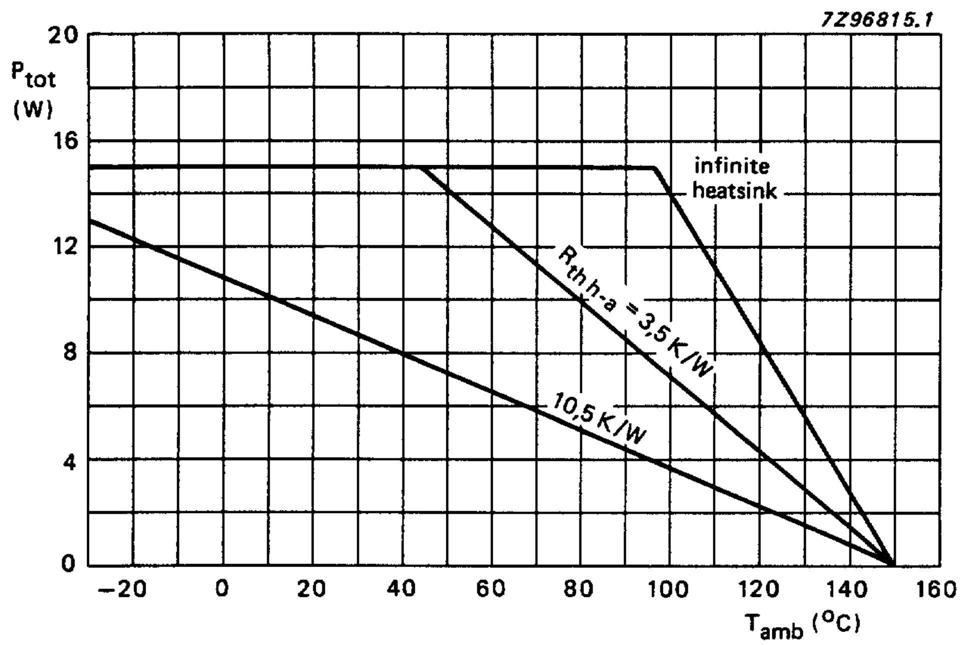


Fig.2 Power derating curves.

HEATSINK DESIGN EXAMPLE

The derating of the encapsulation requires the following external heatsink (for sine-wave drive):

$(R_{th\ j\text{-}mb}) = 3{,}5$ K/W

24 W BTL (4 Ω) or 2 × 12 W stereo (2 Ω); maximum sine-wave dissipation = 12 W;

$T_{amb} = 65$ °C (maximum):

$$R_{th\ h\text{-}a} = \frac{150-65}{12} - 3{,}5 = 3{,}5 \text{ K/W}$$

2 × 7 W stereo (4 Ω); maximum sine-wave dissipation = 6 W; $T_{amb} = 65$ °C (maximum):

$$R_{th\ h\text{-}a} = \frac{150-65}{12} - 3{,}5 = 10{,}5 \text{ K/W}$$

D.C. CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage range		V_P	6,0	14,4	18,0	V
Repetitive peak output current		I_{ORM}	–	–	4,0	A
Total quiescent current		I_{tot}	–	75	120	mA
Stand-by current		I_{sb}	–	–	2	mA
Switch-on current	$V_{11} \leq V_{10}$; note 1	I_{so}	0,15	0,35	0,80	mA

A.C. CHARACTERISTICS

T_{amb} = 25 °C; V_P = 14,4 V; f = 1 kHz; unless otherwise specified

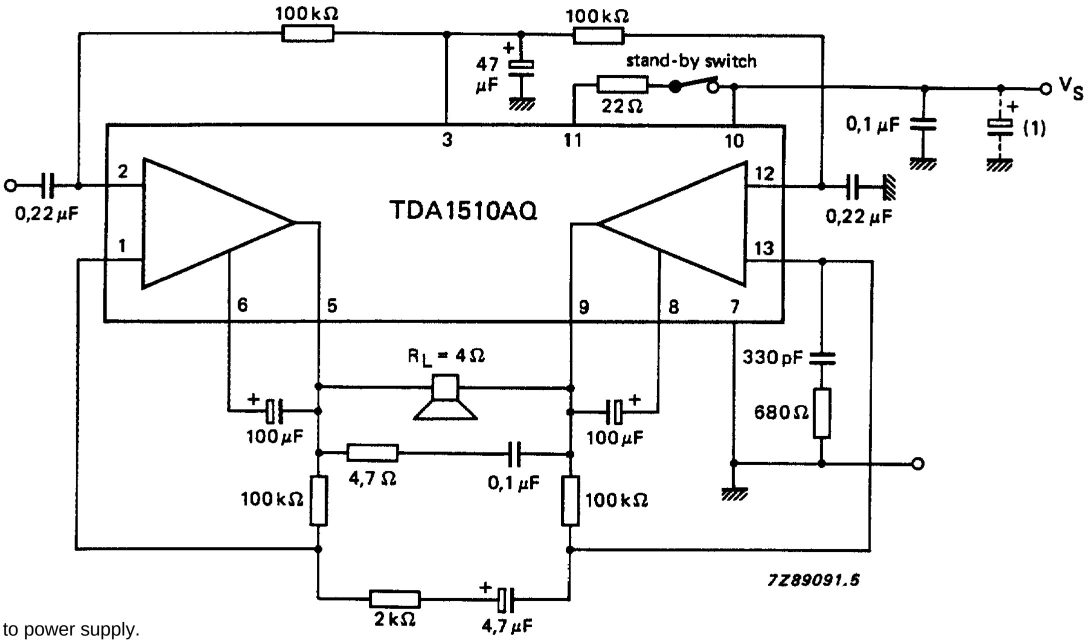
PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Bridge Tied Load application (BTL)						
Output power						
with bootstrap	note 6;					
	R_L = 4 Ω					
	V_P = 13,2 V					
	d_{tot} = 0,5%	P_o	–	15,0	–	W
	d_{tot} = 10%	P_o	–	20,0	–	W
	V_P = 14,4 V					
	d_{tot} = 0,5%	P_o	15,5	18,0	–	W
	d_{tot} = 10%	P_o	20,0	24,0	–	W
Open loop voltage gain		G_o	–	75	–	dB
Closed loop voltage gain	note 2	G_c	39,5	40,0	40,5	dB
Frequency response	at –3 dB; note 3	f_r	–	20 to > 20 k	–	Hz
Input impedance	note 4	$\lvert Z_i \rvert$	1	–	–	MΩ
Noise output voltage						
(r.m.s. value)	f = 20 Hz to					
	20 kHz					
	R_S = 0 Ω	$V_{n\ (rms)}$	–	0,2	–	mV
	R_S = 10 Ω	$V_{n\ (rms)}$	–	0,35	0,8	mV
	R_S = 10 kΩ;					
	according to					
	IEC 179 curve A	$V_{n\ (rms)}$	–	0,25	–	mV
Supply voltage ripple rejection	f = 100 Hz; note 5	SVRR	42	50	–	dB
D.C. output offset voltage between channels		$\lvert \Delta V_{5-9} \rvert$	–	2	50	mV
Power bandwidth	–1 dB;					
	d_{tot} = 0,5%	B	–	30 to > 40 k	–	Hz

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Stereo application						
Output power; with bootstrap	note 6;					
	$R_L = 4\ \Omega$					
	V_P = 13,2 V					
	d_{tot} = 0,5%	P_o	–	4,5	–	W
	d_{tot} = 10%	P_o	–	6,0	–	W
	V_P = 14,4 V					
	d_{tot} = 0,5%	P_o	4,5	5,5	–	W
	d_{tot} = 10%	P_o	6,0	7,0	–	W
	$R_L = 2\ \Omega$					
	V_P = 13,2 V					
	d_{tot} = 0,5%	P_o	–	7,5	–	W
	d_{tot} = 10%	P_o	–	10,0	–	W
	V_P = 14,4 V					
	d_{tot} = 0,5%	P_o	7,75	9,0	–	W
	d_{tot} = 10%	P_o	10,0	12,0	–	W
Output power; without bootstrap	notes 6, 8 and 9					
	$R_L = 4\ \Omega$					
	V_P = 14,4 V					
	d_{tot} = 10%	P_o	–	6	–	W
Frequency response	notes 3 and 6					
	–3 dB	f_r	–	40 to > 20 k	–	Hz
Supply voltage ripple rejection	note 5					
	f = 1 kHz	SVRR	–	50	–	dB
Channel separation	$R_S = 10\ k\Omega$;					
	f = 1 kHz	α	40	50	–	dB
Closed loop voltage gain	note 7	G_c	39,5	40,0	40,5	dB
Noise output voltage						
(r.m.s. value)	f = 20 Hz to 20 kHz;					
	$R_S = 0\ \Omega$	$V_{n\ (rms)}$	–	0,15	–	mV
	$R_S = 10\ k\Omega$	$V_{n\ (rms)}$	–	0,25	–	mV
	$R_S = 10\ k\Omega$;					
	according to					
	IEC179 curve A	$V_{n\ (rms)}$	–	0,2	–	mV

Notes to the characteristics

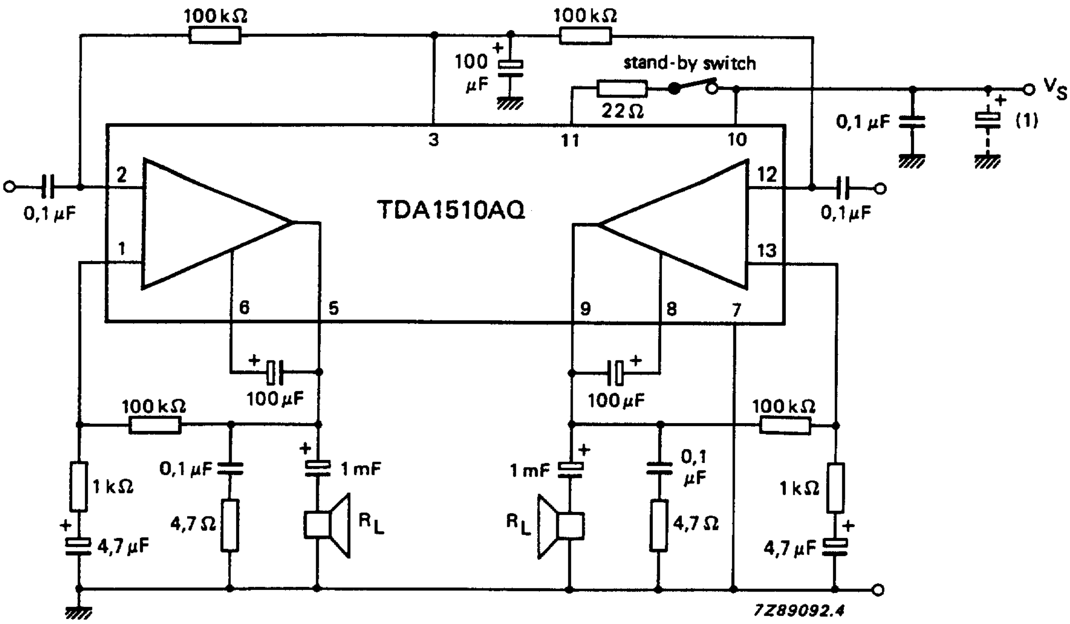
1. If $V_{11} > V_{10}$ then I_{11} must be < 10 mA.
2. Closed loop voltage gain can be chosen between 32 and 56 dB (BTL), and is determined by external components.
3. Frequency response externally fixed.
4. The input impedance in the test circuit (Fig.3) is typ. 100 kΩ.
5. Supply voltage ripple rejection measured with a source impedance of 0 Ω (maximum ripple amplitude 2 V).
6. Output power is measured directly at the output pins of the IC.
7. Closed loop voltage gain can be chosen between 26 and 50 dB (stereo), and is determined by external components.
8. A resistor of 56 kΩ between pins 3 and 7 is required for symmetrical clipping.
9. Without bootstrap the 100 µF capacitor between pins 5 and 6 and the 100 µF capacitor between pins 8 and 9 can be omitted. Pins 6 and 8 connected to pin 10.

APPLICATION INFORMATION



(1) belongs to power supply.

Fig.3 Test and application circuit; Bridge Tied Load (BTL).

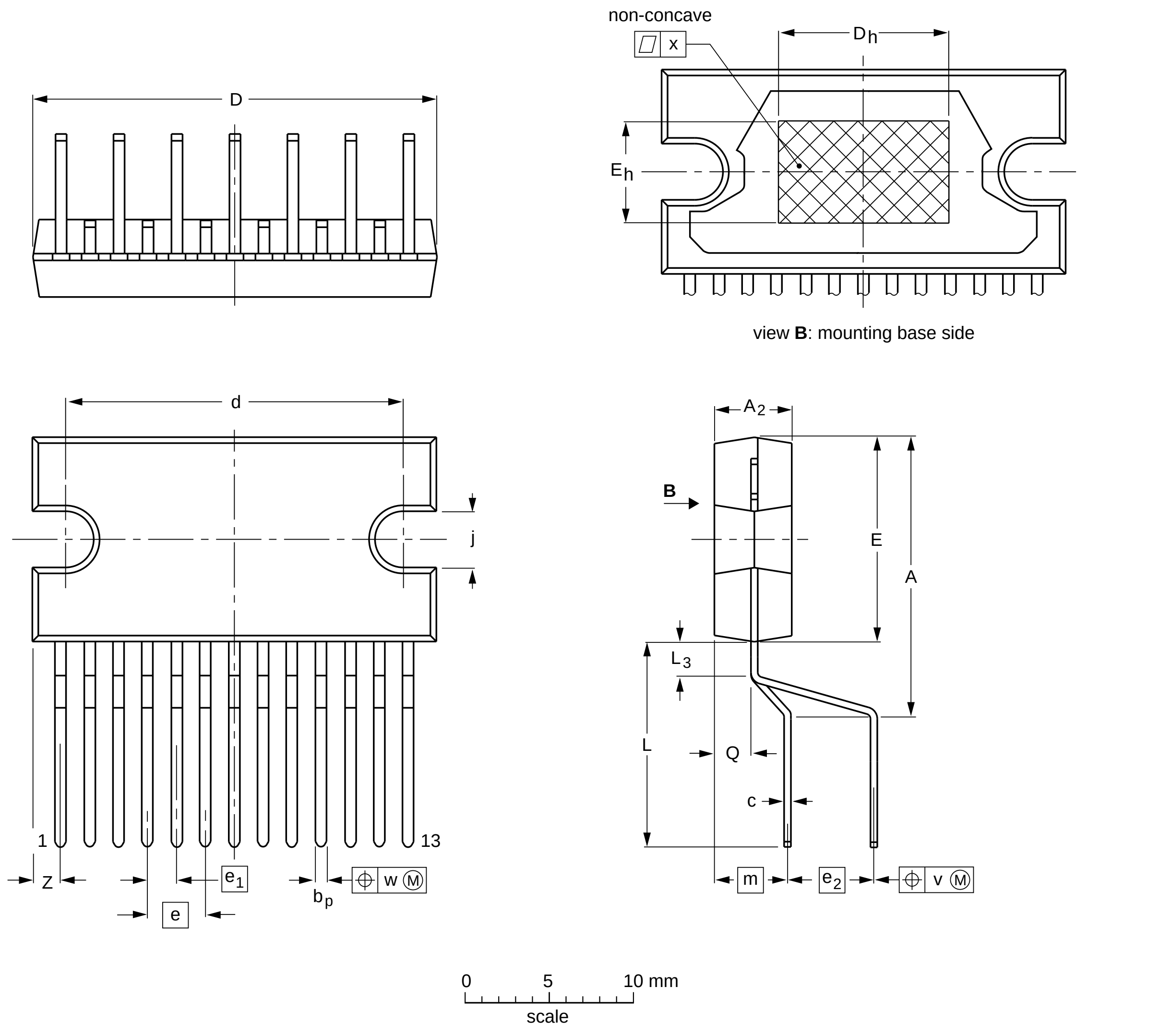


(1) belongs to power supply.

Fig.4 Test and application circuit; stereo mode.

PACKAGE OUTLINE

DBS13P: plastic DIL-bent-SIL power package; 13 leads (lead length 12 mm) **SOT141-6**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_2	b_p	c	D (1)	d	D_h	E (1)	e	e_1	e_2	E_h	j	L	L_3	m	Q	v	w	x	Z (1)
mm	17.0 15.5	4.6 4.2	0.75 0.60	0.48 0.38	24.0 23.6	20.0 19.6	10	12.2 11.8	3.4	1.7	5.08	6	3.4 3.1	12.4 11.0	2.4 1.6	4.3	2.1 1.8	0.8	0.25	0.03	2.00 1.45

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT141-6						~~92-11-17~~ 95-03-11

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.